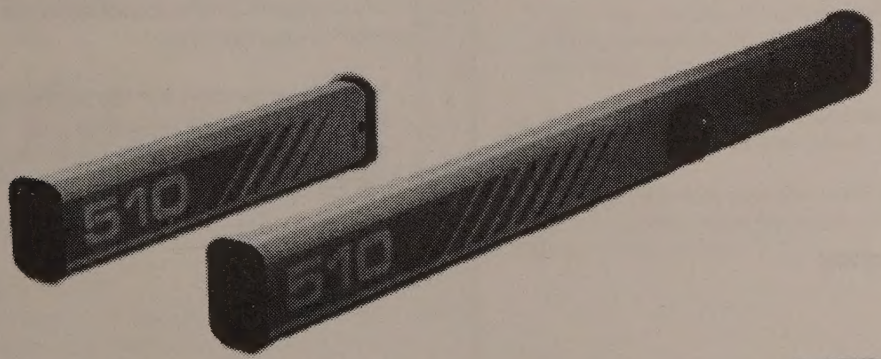
METROTECH®

# MODEL 510 PIPE AND CABLE LOCATOR




**OPERATION MANUAL**
**February, 1999**

Part #: 600A105-A
Price: $5.00

**METROTECH CORPORATION**
488 Tasman Drive
Sunnyvale, CA 94089
Tel: 408/734-1400
Fax: 408/734-1415
1-800-638-7682
Internet Email: Service@metrotech.com

ISO 9001 Certified

**Metrotech's Mission**

Metrotech provides innovative solutions to underground locating problems by being an industry leader in the design, manufacture, and servicing of a comprehensive line of accurate, reliable and easy-to-use locators.

Through innovation and leadership, Metrotech will increase customer productivity by satisfying our customers' need to efficiently install, protect, and maintain their underground plant.

## QUICK START

### 1 Check Batteries

Turn Transmitter ON. Green light will flash. If both the Red and Green lights come on, or neither of them are on, open battery box and rotate batteries in place, or replace batteries (4 ea. AA).

Turn Receiver Knob to "L". Meter will move to green "BATT" zone then drop. If Meter does not reach this zone, replace batteries (2 ea. 9 volt).

### 2 Attach Transmitter to Conductor

Turn Transmitter "OFF". Plug Conductive Attachment into Transmitter. Clamp Red lead to target conductor. Stretch Black lead 90 degrees away from conductor. Push Grounding Rod into earth. Clamp Black lead to Grounding Rod. Turn Transmitter "ON". (See Manual for Inductive set up).

### 3 Adjust Receiver Controls

Move 10 feet (3m) away from Transmitter and conductor. Face away from Transmitter. Turn Receiver Knob to "L". Turn Gain Knob so Meter is at top of "SET".

### 4 Sweep Area Around Transmitter

Stay 10 feet (3m) away from Transmitter. Do not adjust gain. Circle Transmitter. Receiver will beep over conductors. If Receiver does not beep, increase gain and repeat. Check Meter at conductor locations. The highest reading is your conductor.

### 5 Locate Line

Go back to the highest reading location. Sweep Receiver left and right as you walk away from Transmitter. Adjust Gain Knob so Receiver beeps only at center. Stop at 20 feet (6m )intervals and mark ground at highest Meter reading.

See the Operation Manual for Metroclamp, Inductive, Null Mode, Depth Reading, Advanced Techniques, and Sonde.

If you have trouble with your Metrotech 510 Pipe and Cable Locator, check the manual for additional tips. Call us at 1-800-638-7682 for help.

## TABLE OF CONTENTS

**1 Introduction** ..... 1

**2 Model 510 Equipment** ..... 3
2.1 Standard Equipment ..... 3
2.2 Optional Equipment ..... 3
2.3 Technical Specifications ..... 4
2.4 Controls and Indicators - Transmitter ..... 6
2.5 Controls and Indicators - Receiver ..... 7

**3 Safety** ..... 8

**4 Checkout Procedure** ..... 9

**5 Operation** ..... 10
5.1 Transmitter ..... 12
5.1.1 Direct (Conductive) Connection ..... 12
5.1.2 Inductive Coupling with the 4820 Metroclamp ..... 13
5.1.3 Inductive (Indirect Method) ..... 14
5.2 Receiver ..... 16
5.2.1 Tracing (Peak) ..... 16
5.2.2 Verifying the Center Line (Null) ..... 17
5.2.3 Estimating the Depth of a Conductor ..... 18

**6 Verification and "Pre-Survey"** ..... 20
6.1 Ground Survey ..... 20
6.1.1 Locating Conductors ..... 20
6.1.2 Blind Search ..... 20
6.1.3 Subdividing Large Search Areas ..... 20
6.2 Adjacent Conductors ..... 21
6.3 Deep Conductor ..... 21
6.4 Tracing Long Runs ..... 21
6.5 Locating a Service Lateral ..... 22
6.6 Locating a Bend or Dead End ..... 24
6.7 Valves, Manhole Covers, Tees, and Risers ..... 24
6.8 Common Bonded Conductors ..... 24
6.9 Congested Areas ..... 26
6.10 Pipes with Insulated Junctions ..... 27
6.11 Distribution Systems ..... 27
6.12 Non-Metallic Pipes ..... 27

**7 Maintenance** ..... 28
7.1 Replacing the 510 Transmitter Batteries ..... 28
7.2 Replacing the 510 Receiver Batteries ..... 29
7.3 Service Center Information ..... 30

**Appendix** ..... 31
A1 APWA Marking Colors ..... 31
A2 Soil Conditions ..... 31
A3 Field Strength of the Signal ..... 31

**Copyright** ..... 32
**Disclaimer** ..... 32
**Warranty** ..... 32

## List of Illustrations


| Figure | | Page |
|---|---|---|
| 2-1 | Model 510 Pipe and Cable Locator: Standard and Optional Equipment | 2 |
| 2-2 | Model 510 Transmitter: Controls and Indicators | 5 |
| 2-3 | Model 510 Receiver: Controls and Indicators | 6 |
| 5-1 | Direct (Conductive) Connection | 11 |
| 5-2 | Inductive Coupling with the Metroclamp | 13 |
| 5-3 | Peak 510 Receiver Response | 15 |
| 5-4 | Null 510 Receiver Response | 17 |
| 5-5 | Receiver Position When Determining Depth | 18 |
| 5-6 | Estimating the Depth of a Buried Conductor | 19 |
| 6-1 | Blind Search: Parallel Pattern | 19 |
| 6-2 | Adjacent Conductors: Position of Ground Lead | 21 |
| 6-3 | Locating Service Laterals | 22 |
| 6-4 | Locating a Bend | 23 |
| 6-5 | Locating a Dead End | 23 |
| 6-6 | Incorrect Coupling for Congested Area | 25 |
| 6-7 | Correct Coupling for Congested Area | 25 |
| 6-8 | Reduce Signal on "A" When Locating "B" | 26 |
| 7-1 | Replacing the 510 Transmitter Batteries | 28 |
| 7-2 | Replacing the 510 Receiver Batteries | 29 |

# 1 INTRODUCTION

The Metrotech Model 510 Pipe and Cable Locator is a versatile locating instrument designed for locating buried pipes, cables, and wires.

The Transmitter generates a signal which is applied to the pipe or cable to be traced – referred to from now on as the "conductor". The signal travels along the conductor, becoming weaker as it gets farther away from the Transmitter.

The Receiver detects the signal from the conductor, enabling the operator to trace the path of the pipe or cable. The meter reading and the audio tone direct the operator to the path of the conductor.

The maximum tracing distance depends on the method of connection, the surrounding soil, and the type and depth of the conductor. Depth measurement is accomplished using the triangulation method.

As with all electromagnetic locating systems, this unit is designed to locate metallic conductors only. The word "conductor, pipe, or cable" refers to a metallic conductor throughout this manual.

**Figure 2-1: Model 510 Pipe and Cable Locator: Standard Equipment and Optional Equipment**

# 2 MODEL 510 EQUIPMENT

## 2.1 Standard Equipment

| Model Number | Description | Remarks |
|---|---|---|
| 510 | Transmitter | |
| 510 | Receiver | |
| 800B004 | Conductive Attachment Assembly | Direct Connect Cable, Ground Spike, and Ground Plate |
| 500C283 | Anchor Cord | Elastic cord for suspending Transmitter |
| 500D140 | Carrying Case | Soft sided vinyl |
| 600A105 | Operation Manual | |

## 2.2 Optional Equipment

| Model Number | Description | Remarks |
|---|---|---|
| 4820 | Metroclamp and jumper cable | For use in Inductive Coupling mode |
| 400B246 | Conductive Attachment | Telephone style clamps |
| 400A132 | 100' Ground Lead Extension | |
| SON830 | Sonde 83 kHz | |
| SFL-2 | Sheath Fault Locator | Accessory for simultaneous sheath fault locating. |

Features of the Model 510 Transmitter and Receiver are discussed in detail in Sections 2.4 and 2.5.

## 2.3 Technical Specifications

### Transmitter

| | |
|---|---|
| **Nominal output power:** | |
| **Conductive Mode:** | 100mW avg. across 1K ohms |
| **Output Frequency:** | 83kHz Continuous Wave |
| **Battery Type:** | Four size AA Alkaline Cells |
| **Battery Life:** | 30–60 hours continuous use |
| **Operation Temperature:** | -4° to 122° F (-20° to 50° C) |
| **Dimensions:** | 13"L x 2 3/4" H x 1 3/4"D (33cm x 7 cm x 4.5 cm)) |
| **Weight:** | 1 lb. (.45 kg) |

### Receiver

| | |
|---|---|
| **Sensitivity:** | 1 microamp (Req'd signal at 3 ft. for 50% meter deflection |
| **Battery Type:** | Two size 9V Alkaline Cells, Neda 1604 |
| **Battery Life:** | 120 hours avg. continous use |
| **Battery Check:** | Automatic power-on |
| **Operation Temperature:** | -4° to +122° F (-20° to +50° C) |
| **Dimensions:** | 30 1/2"L x 2 3/4" W x 2 1/8"D (77.5cm x 7cm x 5.4 cm) |
| **Weight:** | 1.75 lbs. (.0.8 kg) |

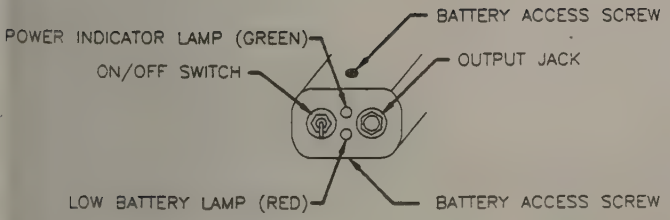



**Figure 2-2: Model 510 Transmitter: Controls and Indicators**

## 2.4 Transmitter - Controls and Indicators

See Figure 2-2 for an illustration of the features described below.

**ON/OFF SWITCH**
Push this switch up to turn the Transmitter on. Green Power Indicator Lamp will blink.

**OUTPUT JACK**
Insert either the Direct Connect Cable or the 4820 Metroclamp cable into this jack.

**POWER INDICATOR LAMP (GREEN)**
A blinking green light indicates power is on.

**LOW BATTERY LAMP (RED)**
Red light blinks when battery is below 25% charge. Remains on when below 20% charge.

**BATTERY ACCESS SCREWS**
Remove end cap to gain access to the batteries.

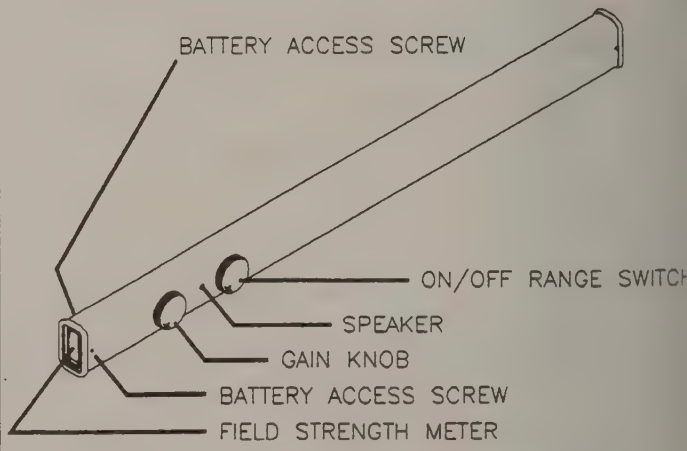



**Figure 2-3: Model 510 Receiver: Controls and Indicators**

## 2.5 Receiver - Controls and Indicators

See Figure 2-3 for an illustration of the features described below.

**FIELD STRENGTH METER**
The meter indicates the signal strength detected by the Receiver. The reading will vary from locate to locate according to conductor type and conditions and how close the Receiver is to the conductor. The Receiver displays the highest reading when it is directly over the target conductor.

**BATTERY TEST INDICATOR**
When the Receiver is turned on, the needle on the meter should briefly move into the BATT test area. If it does not, replace the batteries.

**GAIN SET LEVEL**
Used as an initial guide for adjusting the gain level before tracing.

**GAIN KNOB**
Controls the signal gain. Set as low as possible to avoid receiving signal from conductors other than your target conductor.

**SPEAKER**
Emits audio tone to guide operator toward the targeted conductor.

**OFF/ON RANGE KNOB**
Four positions:

| | | | |
|---|---|---|---|
| **OFF** | | | |
| **L** | – | **Low** | Adjusts instrument sensitivity |
| **M** | – | **Medium** | so gain range can be fine tuned |
| **H** | – | **High** | Use lowest range possible. |

**BATTERY ACCESS SCREWS**
Remove end cap to gain access to the batteries.

## 3 SAFETY

1 Metrotech Pipe and Cable locators are intended for use by utility and contractor professionals. Safety hazards for underground utility access areas include electrical shock, explosive gases, and toxic fumes.

2 Familiarize yourself with all required practices of the local utility company before entering an access area or attaching a Metrotech Transmitter.

3 Before attaching the Transmitter directly to any conductor, check for electrical current. Pipes are sometimes improperly used for grounding and may carry live current. If electrical current is present, disconnect the source using proper procedures.

4 If you use the Metroclamp on energized electrical or control lines follow established safety procedures.

5 Pay special attention when using a locator in high traffic areas.

## 4 CHECKOUT PROCEDURE

To insure proper operation of the Model 510 Pipe and Cable Locator, use the checkout procedure below at the following times:

- upon receiving the equipment
- before each job, preferably before you leave for the site
- if problems arise during a locate

***** WARNING•••**

Do not connect the Transmitter directly to a live power cable. Always make sure the power to a cable is turned off before you connect the Transmitter to it.

***** CAUTION•••**

Do not operate the Transmitter in the Inductive Mode while it is resting on or near a metal surface or large metal object. Incorrect test readings and damage to the Transmitter may result.

1 Turn the Transmitter on and place it on the ground. If both or neither red and green lights come on, open the battery box and rotate the batteries in place. Try turning the Transmitter on again. Replace batteries if Transmitter does not come on after battery position adjustment.

2 Turn the Receiver RANGE KNOB to the "Low" range.

3 Set the GAIN KNOB to "9 o'clock".

4 Hold the Receiver with the knobs facing up. Aim the Receiver at the small arrows on the Transmitter. The meter needle should move to 100, and the audio tone should be loud.

5 Move away from the Transmitter, holding the Receiver in the same position. At 5-10 feet the signal level should start to drop. The meter needle will move to the left and the audio tone will begin to fade.

6 Hold the Receiver parallel to the Transmitter. Both the meter reading and the audio tone should suddenly drop.

## 5 OPERATION

Follow the Checkout Procedure described in Section 4 before operating the equipment.

To operate the 510 Pipe and Cable Locator use the Transmitter to apply the signal to the conductor, and use the Receiver to trace the signal from the conductor.

**••• NOTE •••**

Most problems in locating come from improperly setting up the Transmitter. You must be sure that you have the best possible connection to the target conductor and that the conductor is well grounded. If there is a break in the circuit path your tracing distance and depth will be severely limited. Look for disconnected leads, circuit breakers, open switches, insulators, etc.

Power lines and telephone sheaths are generally grounded. If you are tracing a conductor with an exposed insulated joint, such as a gas pipe with a gas meter, use the jumper cable to bypass the meter (insulator). Attach each end of the jumper cable to opposite sides of the insulator.

***** WARNING! *****

Do not connect the Transmitter directly to a live power cable. Always make sure the power to a cable is turned off before you connect the Transmitter to it.

***** CAUTION *****

Do not operate the Transmitter in the Inductive Mode while it is resting on or near a metal surface or large metal object. Incorrect test readings and damage to the Transmitter may result.

**Transmitting and Receiving Methods**

There are three different methods of applying the signal to the conductor with the Transmitter – Direct Connection, Inductive Coupling and Inductive. A description of each method and use instructions follows.

In addition to three different methods of applying the signal onto the conductor, there are two methods – PEAK and NULL – to locate your conductor.

The PEAK method is generally used to follow the path or direction of a line. It is the preferred method for general locating because the sensitivity or gain can be kept to a minimum which prevents receiving signals which have bled off onto nearby lines.

The NULL method is used for confirming the center line of a conductor. Confirm the center line before determining the depth of a conductor.

PEAK and NULL procedures are described in Sections 5.2.1 and 5.2.2.

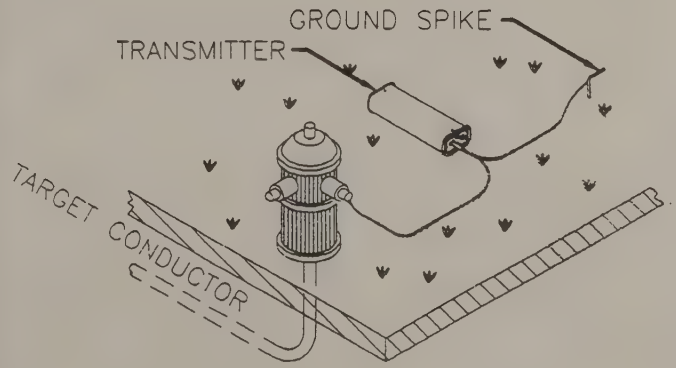



**Figure 5-1: Direct (Conductive) Connection**

## 5.1 Transmitter

### 5.1.1 Direct (Conductive) Connection

This is the preferred mode of operation because the Transmitter is connected directly to a metallic part of the conductor (hydrant, meter, riser, valves, sheath , tracer wire) allowing the maximum signal to reach the conductor. In this operating mode the Receiver can be closer to the Transmitter, and adjacent buried conductor interference is reduced.

***** WARNING! *****

Do not connect the Transmitter directly to a live power cable. Always make sure the power to a cable is turned off before you connect the Transmitter to it.

1 Turn the Transmitter off. Plug the Direct Connect Cable into the OUTPUT JACK on the 510 Transmitter.

2 Attach the RED lead of the Direct Connect Cable to an electrically clean metallic part of the targeted conductor.

3 Place the Transmitter on the ground, parallel to the conductor.

4 Extend the BLACK lead of the Direct Connect Cable as far as possible from the conductor, at a right angle. Be careful not to get close to or cross any adjacent buried conductors. At this point, drive the ground spike as far into the ground as possible, and attach the BLACK lead to it. Use the ground plate only when the ground surface is too hard to drive a spike into it. Place the plate on the ground and attache the BLACK lead (which is at right angles to the conductor). To improve conductivity of the plate, put water and/or a weight on it. See Figure 5-1.

5 Turn the Transmitter POWER SWITCH "on". The green lamp should blink steadily, indicating a charged battery. If both or neither red and green lights come on, open the battery box and rotate the batteries in place. Try turning the Transmitter on again. Replace batteries if Transmitter does not come on after battery position adjustment.

6 Continue your locate by following steps 1 through 8 Section 5.2.1 Tracing, page 19.

### 5.1.2 Inductive Coupling with the 4820 Metroclamp

Use this method if Direct Connection is not possible, but you can position a Metroclamp around the conductor you want to trace. The Transmitter induces a signal through the Metroclamp directly on to the conductor.

**Metroclamp Ground Requirements**

If you are using the Metroclamp around a cable, both ends of the cable must be grounded to insure sufficient field strength. Power lines and telephone sheaths are generally grounded. When tracing lines that have insulators, the insulators should be temporally bypassed, using the supplied jumper cable.

1 Turn the Transmitter OFF. Plug the 4820 Metroclamp cable into the OUTPUT JACK on the 510 Transmitter.

2 Place the Metroclamp around the conductor, below the electrical ground. See Figure 5-2. Make sure that the clamp jaws are completely closed.

3 Place the Transmitter on the ground, parallel to the conductor. Turn the Transmitter ON.

4 Continue your locate by following steps 1 through 8 in Section 5.2.1 Tracing.

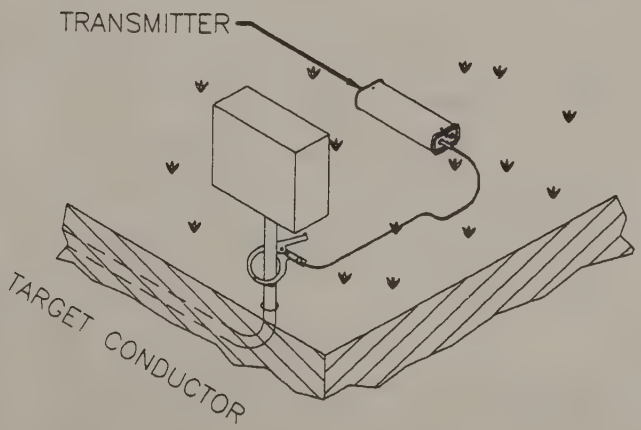



**Figure 5-2: Inductive Coupling with the Metroclamp**

### 5.1.3 Inductive (Indirect Method)

This is the least preferred method of applying signal to isolate one conductor. The signal is broadcast in all directions and can couple to every nearby conductor through electromagnetic induction.

Sometimes it is not possible to gain access to the pipe or cable to make a direct connection or use the Metroclamp. In these cases use the Transmitter's internal antenna.

The Transmitter will broadcast the signal from the internal antenna until a cable or Metroclamp plug is inserted in the OUTPUT JACK.

No ground connection is needed when a signal is induced onto the target conductor.

***** CAUTION *****

Do not operate the Transmitter in the Inductive Mode while it is resting on or near a metal surface or large metal object. Incorrect test readings and damage to the Transmitter may result.

1 Remove any cable or clamp from the OUTPUT JACK. Position the Transmitter across the buried conductor as indicated by the arrows on the Transmitter. Make sure the arrows are directly over the targeted conductor. Turn the Transmitter ON.

2 Move the Receiver 35-50 ft. away from the Transmitter to avoid picking up signal traveling through the air. The required distance depends on how high the gain is set. The higher the gain, the farther from the Transmitter the Receiver must be to begin tracing.

3 Continue your locate by following steps 1 through 8, Section 5.2.1 Tracing, page 16.

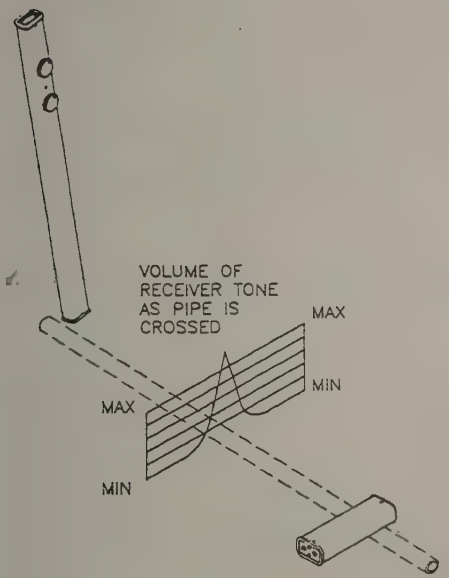



**Figure 5-3: Peak 510 Receiver Response**

## 5.2 Receiver

### 5.2.1 Tracing (Peak)

When starting a locate, first locate the targeted conductor using the broad range PEAK method. Then verify the exact location of the conductor with the NULL method.

**PEAK METHOD**

The PEAK method gives a maximum reading and loud tone over the conductor. Hold the 510 Receiver at a comfortable angle with the knobs facing upward. Move it from side to side. The audio tone and meter reading will increase as you approach the conductor and decrease as you move away. See Figure 5-3.

1 Move 10 feet (3m) away from the Transmitter and the conductor. With your back to the Transmitter, turn the RANGE KNOB on the Receiver to "L". Turn the GAIN KNOB so the METER is at "SET".

2 Sweep the area around the Transmitter. Stay 10 feet (3m) away from the Transmitter. Do not adjust the gain. Circle the Transmitter. The Receiver will beep over the gain and repeat. Check the METER at these locations. The one with the highest reading is your target conductor.

3 Return to the conductor with the highest reading. Aim the Receiver 18" (1/2m) to the side of the conductor. Adjust the GAIN KNOB so the meter is at the "SET" position. Sweep the Receiver left and right as you walk away from the Transmitter. Increase the gain setting as required. It is important to tune the gain as low as possible in order to sharpen the reception.

4 Stop every 20 feet or so and carefully find the spot of maximum meter deflection. Mark this spot as the center line. You will verify it later using the NULL method.

5 As you move away from the Transmitter, set the Receiver RANGE KNOB to "Medium", then "High" as required. Continue as before.

6 If the signal strength drops abruptly, the conductor may have changed direction, dropped in depth, or ended. To determine which direction your conductor is going, stop and vertically rotate the Receiver to the left and right. The highest signal strength reading indicates the direction of the conductor. Continue tracing the conductor in this direction.

### 5.2.2 Verifying the Center Line

**NULL METHOD**

To confirm the location of the conductor use the NULL method. Turn the 510 Receiver on its edge and hold it above and parallel to the conductor. (See Figure 5.4). As you move the Receiver across the conductor, the tone will sound as you approach, fall silent at the center, then sound again as you move away.

1 Return to your first center line mark closest to the Transmitter. Hold the Receiver edge side up (the knobs facing left) and parallel to the conductor. Adjust the gain until the Receiver falls silent over the center line and tones on either side.

2 Mark the center line location determined with the NULL method. If this location matches the PEAK center line you have verified the conductor location.

3 If the NULL location is to one side of the peak location your signal has been distorted by other conductors or local interfer ence. The true conductors or local interference. The true center line will be to the side of the PEAK location opposite the NULL location.

4 When you have confirmed the conductor's location, mark it as required. See Appendix for APWA color markings.

5 When you have finished the locate, turn the Transmitter and Receiver off and disconnect the accessories.

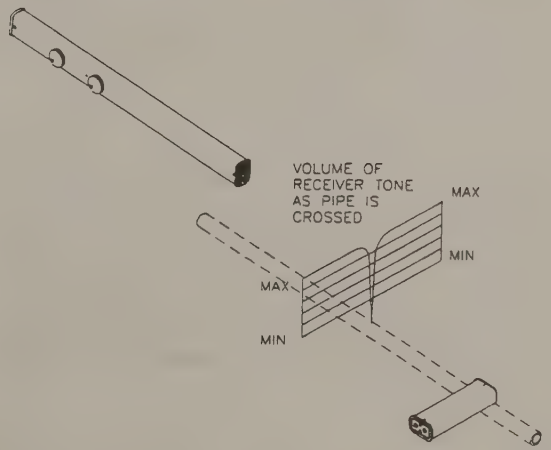



**Figure 5-4: Null 510 Receiver Response**

### 5.2.3 Estimating the Depth of a Conductor

Follow this procedure to estimate the depth of a buried conductor:

1 Move at least 35 feet from the Transmitter. This prevents the Receiver from detecting the transmitted signal directly through the air. Using the PEAK and NULL methods, find the exact location of the conductor. Locate and mark the conductor.

2 Stand so you are facing down the length of the conductor and are directly over it. Rotate the Receiver to the PEAK position. Stand it vertically over the conductor. Tilt the Receiver 45 degrees to the side of the conductor. Without moving the Receiver, change your position so you can sight down through the stripes on the unit to set the angle. (See Figure 5-5). Adjust the GAIN KNOB until the meter reads 75. Back away from the conductor. The meter will increase then decrease. When it returns to 75, stop. Mark this spot on the ground.

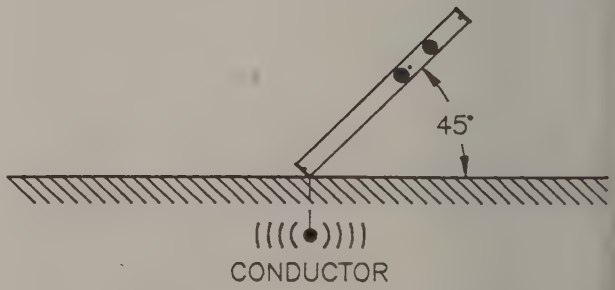



**Figure 5-5: Receiver Position When Determining Depth**

3 Repeat Step 2 on the opposite side of the conductor. This will eliminate errors caused by a distorted signal.

4 Measure the distance between the two spots. Divide the distance by two. The result is a good estimate of the conductor depth. See Figure 5-6.

5 Measurement accuracy is affected by the conductor size and depth. The larger the diameter the less accurate the depth measurement. Depth measurements are also affected by soil conditions, overhead lines, and adjacent conductors.

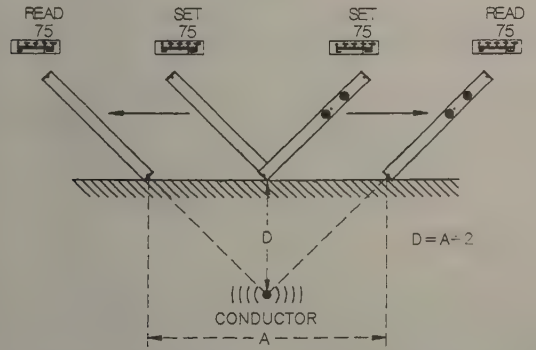



**Figure 5-6: Estimating the Depth of a Conductor**

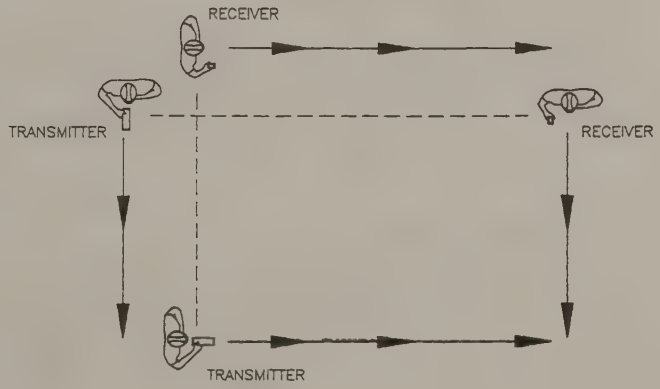



**Figure 6-1: Blind Search: Parallel Pattern**

# 6 ADVANCED TECHNIQUES

## 6.1 Ground Survey

Regulations at construction sites often require a ground survey before any excavation is done. This prevents damaging underground utilities. A ground survey is a process to locate all the underground conductors within a particular area. It includes standard locating and a blind search. A blind search is a search for conductors with unknown sources and ending. The 510 must be operated in the Inductive Mode using a systematic grid approach.

### 6.1.1 Locating Conductors

First use one of the three modes of operation (Directed Connect most accurate) to locate the known utilities and mark their location on the ground. Follow the procedures outlined in Section 5.

### 6.1.2 Blind Search

Two operators are required for a blind search. One carries the Transmitter, the other operates the Receiver. Starting approximately 20-30 feet apart, the two operators move in parallel across and then down the survey area. Hold the Transmitter parallel to the ground with either end pointing away from you. Aim the Receiver at the side of the Transmitter. Adjust the gain down until the Receiver does not detect the Transmitter directly through the air.

The operator with the Receiver holds the Receiver vertically with the knobs facing to the left. Walk together across the search area. The meter reading on the Receiver will indicate the presence of a conductor under the ground as the operators pass over it. Mark the location of each conductor along your survey path.

Repeat this process until you have covered the entire width of the area. Then change your direction of travel 90 degrees and search across the same area. After executing this procedure in both directions, go back and use the standard inductive mode (Section 5.1.3) to trace the path of each conductor you have marked.

### 6.1.3 Subdividing Large Search Areas

If you are working in a large search area, subdivide it into several smaller areas. Then complete the blind search as outlined above for each smaller area before going on to the next one.

## 6.2 Adjacent Conductors

When the meter reading drops off more on one side of the conductor than it does on the other, the Receiver may be picking up interference from an adjacent or parallel conductor. Adjust the sensitivity to compare the signal strength of the conductors. In most cases, the conductor with the stronger signal is the target conductor. Confirm the exact location of the adjacent conductors. Place your ground lead so that it does not cross any adjacent conductors, is perpendicular to, but as far away from your target conductor as possible. (Figure 6-2)

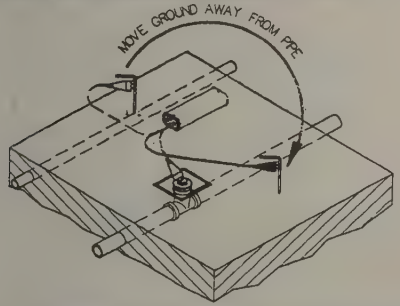



**Figure 6-2: Adjacent Conductors: Position of Ground Lead**

Note evidence of other underground utilities in the area, such as transformers, pedestals, hydrants, meters, etc. which indicate the presence of other underground conductors.

## 6.3 Deep Conductor

Signals picked up by the Receiver from deeply buried pipes are weaker and not as directionally distinct as those from pipes closer to the surface. In addition, the meter reading will only change by small increments in relation to moving the Receiver antenna.

Using the Inductive (Indirect) Method of coupling signal to the conductor may be difficult if the target conductor is buried four feet or more. For best results, use the Direct (Conductive) Connection method of coupling signal to the targeted conductor.

## 6.4 Tracing Long Runs

Signals picked up by the Receiver get weaker as you move farther and farther away from the Transmitter coupling point, especially on long pipe runs. To get a stronger signal, move the Transmitter coupling point closer to the Receiver. If forced to use the Inductive Indirect mode, your tracing job will be easier if an assistant follows behind with the Transmitter as you trace with the Receiver.

## 6.5 Locating a Service Lateral

After you have traced the main, you may want to go back and locate the service laterals off the main. Service laterals are easiest to find using the Inductive Mode. Two operators are required for this procedure - Operator 1 remains stationary holding the Receiver as if to trace the main. Operator 2, carrying the Transmitter, holding it perpendicular to the main line, and maintaining a minimum of 100 ft. between himself and the Receiver, walks parallel but 5 feet from the main on the side he expects to find the service laterals as shown in Figure 6-3. The meter reading on the Receiver will increase as Operator 2 crosses over the service lateral with the Transmitter. Each time the meter reading increases Operator 1 signals Operator 2 and he/she marks the lateral locations on the ground.

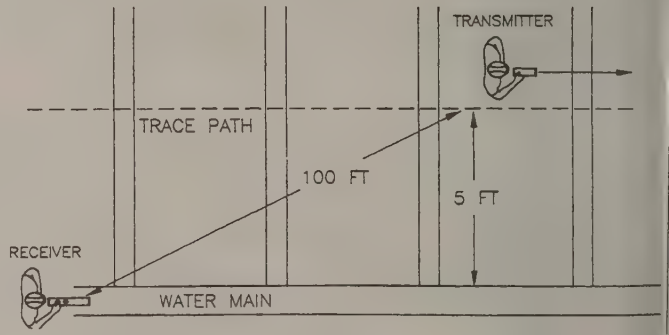



**Figure 6-3: Locating Service Laterals**

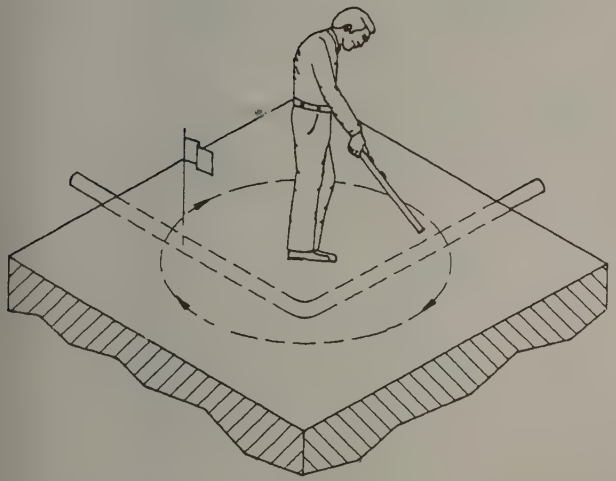


Figure 6-4: Locating a Bend

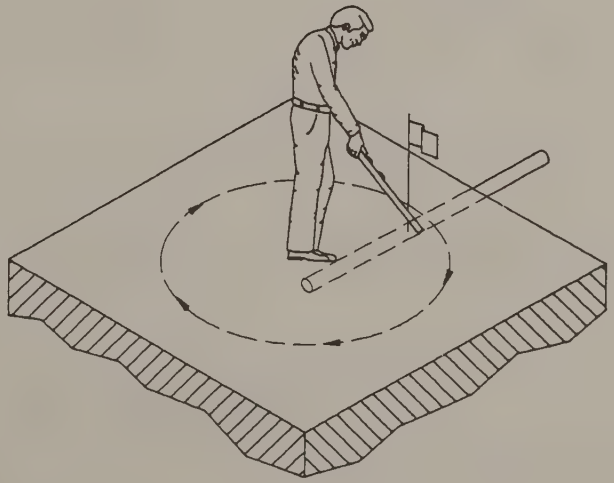


Figure 6-5: Locating a Dead End

### 6.6 Locating a Bend or Dead End

While tracing a line, you may find that the meter reading drops off suddenly, and that there is no distinct reading when the Receiver antenna is moved left or right. Stand in place and continue sweeping the antenna from side to side but at the same time slowly pivot your body.

If you find a pivot angle at which the meter reading picks up again, it means you've located a bend and can resume tracing in the new direction. (Figure 6-4).

If you pivot all the way around (360 degrees), without getting any noticeable meter reading, it means you've reached a dead end. (Figure 6-5).

### 6.7 Valves, Manhole Covers, Tees and Risers

If the meter reading suddenly increases and then falls back while tracing a pipe you have probably passed over a buried valve, manhole cover, tee, or riser.

### 6.8 Common Bonded Conductors

Telephone, power, and CATV sometimes use a common ground bond. If other conductors are connected to your target conductor, putting a signal on the target can cause all the conductors to carry the same signal, making it difficult to identify the target conductor.

To verify that you are tracing the targeted conductor, note the field strength at a knob location of the conductor. As you trace, any change in field strength should be gradual. If either reading changes abruptly you are probably no longer over your targeted conductor.

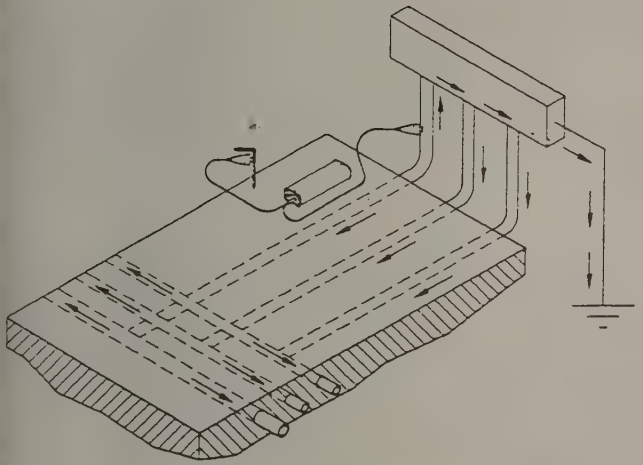


Figure 6-6: Incorrect Copling for Congested Area

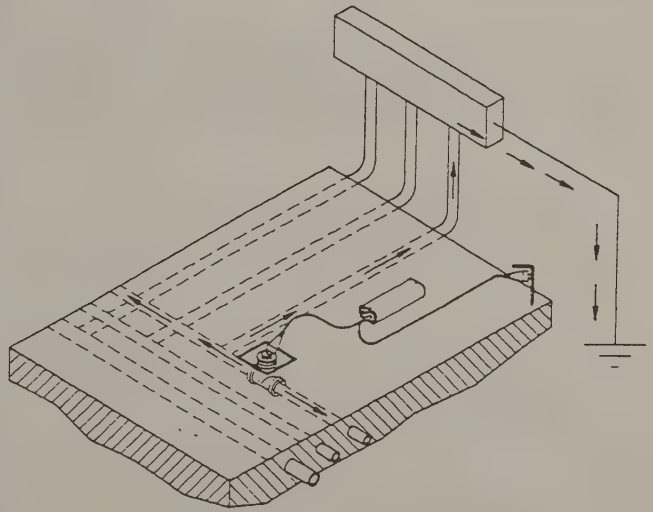


Figure 6-7: Correct Coupling for Congested Area

### 6.9 Congested Areas

If you suspect that coupling from adjacent conductors is causing interference in the signal picked up by the Receiver, try increasing the strength of the signal received from the Transmitter and decreasing the strength of signal from the interfering conductors by:

1 Changing to a different Transmitter coupling point or coupling mode. (Figures 6-6 and 6-7).

2 Improving the grounding connection or moving the grounding point.

3 Determine the location of the adjacent conductors. Then check to be sure that neither the direct connect cable or the ground cable cross over any of the adjacent conductors. Reposition them if necessary. (Figure 6-2).

4 If you are using the Inductive (Indirect) mode, you may be able to decrease the amount of interfering signal by changing the orientation of the Transmitter to the targeted conductor. Determine the location of the interfering conductor. Stand the Transmitter on its end (vertically) over the interfering conductor. This will reduce or eliminate signal on this line. (Figure 6-8)

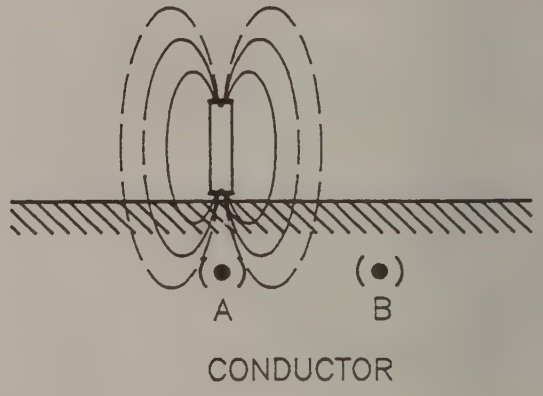



**Figure 6-8: Reduce Signal on "A" When Locating "B:**

### 6.10 Pipes with Insulated Junctions

The high radio frequency signal of the 510 Pipe and Cable Locator will cross pipe insulators, however, the signal will proportionately decrease each time it crosses an insulator. When possible, such as when tracing a pipe with a meter, bypass the meter (insulator) by using a jumper cable. Attach each end of the jumper cable on opposite sides of the insulator.

### 6.11 Distribution Systems

To locate short gas services on a gas distribution system, you should temporarily ground the end of the service. This can be accomplished by temporarily connecting a jumper cable to a ground spike at the end of a service, where the pipe or tracer wire comes out of the earth. Be sure to remove the ground connection after completing the locate so as not to defeat the cathodic protection system.

### 6.12 Non-Metallic Pipes

To trace nonmetallic pipe (sewer line) or duct, send the signal through the pipe by inserting a Model SON830 Sonde. An alternate method is to insert a snake or fishtape into the pipe and connecting the Direct Connect Cable from the Transmitter to one end of it.

## 7 MAINTENANCE

The only routine maintenance required for the Model 510 equipment and accessories is to test and replace, if necessary, the batteries in the Transmitter and the Receiver. Both possess battery test features, making it easy to check the condition of the batteries at any time.

The 510 is designed for rugged outdoor use, but rough handling should be avoided. Keep the equipment dry, clean, and free of grit. Store the 510 (in its carrying case) in a cool, dry place. Do not expose to excessive temperature.

We recommend checking the Transmitter and Receiver batteries before each use, preferably before leaving for the job site.

### 7.1 Replacing the 510 Transmitter Batteries

1 Have ready four AA Cell batteries.

2 To test the Transmitter batteries, turn the power switch on. The green LED will blink steadily if the batteries are in good condition. It will begin to slow down as the batteries lose power. If the red light comes on, batteries are low and need replacing.

3 Unscrew the two screws on the end of the 510 Transmitter. Carefully pull out the battery housing (the housing will be attached to the inner workings).

4 Remove and replace all four batteries, noting polarity.

5 Replace the battery housing and screw into place.

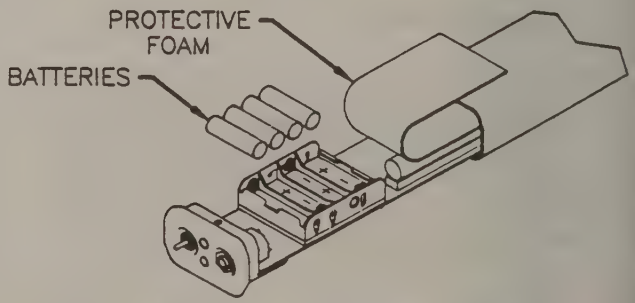



**Figure 7-1: Replacing the 510 Transmitter Batteries**

### 7.2 Replacing the 510 Receiver Batteries

1 To test the Receiver batteries, turn the RANGE KNOB to "LOW". The needle on the FIELD STRENGTH METER should move into the BATT test area. If it does not, the batteries need to be replaced.

2 Have ready two Alkaline NEDA 1604A 9V batteries.

3 Unscrew the two screws on the handle end of the 510 Receiver. Carefully pull out battery/meter housing (the housing will be attached to inner workings by a cable).

4 Remove and replace both batteries.

5 Replace battery/meter housing and screw into place.

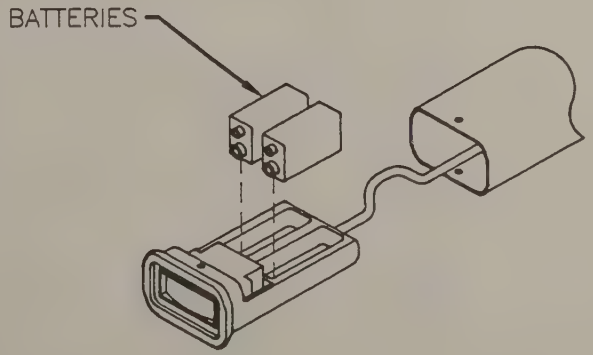



**Figure 7-2: Replacing the 510 Receiver Batteries**

## 7.3 Metrotech Service Centers

If the equipment does not function properly, replace or recharge the batteries as described in the sections above. If the equipment still malfunctions, contact a Metrotech Service Center:

**Metrotech West Coast Service Center**
488 Tasman Drive
Sunnyvale, CA 94089
1-800-638-7682

**Metrotech East Coast Service Center**
1824 Murfreesboro Road
Suite 104
Nashville, TN 37217
1-800-624-6210

**Seba Dynatronic - European Service Center**
Dr.-Herbert-lann-Str. 6
D-96148 Baunach, Germany
Tel: +49 9544-680
Fax: +49 9544-2273

or call the factory for the nearest authorized Metrotech repair station.

Additional Metrotech Instruments: Multiple and Dual Frequency Locators, Fiber Optic Cable Locating System, Pipe and Cable Locators, Magnetic Locators, Sheath Fault Locators, Leak Detectors, Valve Box Locators, 50/60Hz Detectors, and a variety of transmitting sondes and flexi-sondes.

# Appendix

## A1 APWA Marking Colors

The following color markings have been established by the American Public Works Association (APWA):

| Conductor | Color |
|---|---|
| Electric power lines, cables, or conduits | Red |
| Communication lines, cables, conduits, CATV | Orange |
| Gas, oil, petroleum, or other gaseous materials | Yellow |
| Sewers, storm and sanitary, drain lines | Green |
| Water, irrigation, or slurry lines | Blue |

Note: If you have any questions regarding marking requirements or procedures, please call your local One Call Center.

## A2 Soil Conditions

The type and condition of the soil that you are locating through greatly affects the quality of your locate. Soil types and possible remedies for the conditions are listed below:

| Soil Type | Affect and Remedy |
|---|---|
| moist, compact | ideal |
| dry, sandy or rocky | Little or no moisture content creates a poor tracing environment. Wet the soil around the ground spike. |
| alkaline, high iron content | Poor tracing environment. Change ground spike location. |

## A3 Field Strength of the Signal

The field strength decreases as you move away from the target conductor and as you move farther away from the Transmitter. For optimum tracing accuracy, the field strength should read at least 50 on the meter at maximum gain. If your signal drops below 50 before you have completed your locate, move the Transmitter to the location of your last known reading and continue with your locate.

## COPYRIGHT

The information contained in this document is for informational purposes only and is subject to change without notice. Metrotech Corporation makes no warranty of any kind with regard to the information contained in this manual, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Metrotech shall not be liable for errors contained herein, nor for incidental or consequential damages from the furnishing of this information.

This manual contains proprietary information that is protected by copyright. All rights are reserved. No part of this manual may be photocopied, reproduced, magnetically stored, transmitted, or translated into another language without prior written consent of Metrotech Corporation.

© Metrotech Corporation 1999

## DISCLAIMER

When hooking to live power via an inductive clamp, be certain clamp is connected around power line, not directly onto the power line. Please follow your own company's safety standards, and OSHA requirements.

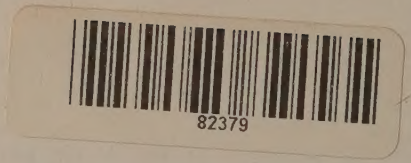
## WARRANTY

THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY, BEYOND THOSE STATED HEREIN.

Metrotech warrants its equipment to be free from defects in workmanship and material under normal and proper use and service for one year from date of purchase by original user. Metrotech assumes no obligation to repair or replace equipment which has been altered or repaired by other than a Metrotech-approved procedure, been subject to misuse, misapplication, improper maintenance, negligence, or accident; has had its serial number or any part there of altered, defaced or removed; or been used with parts other than those approved by Metrotech. Warranty does not include batteries. Expendable items such as fuses and lamps are excluded.

Any detection product proved defective under this warranty will be repaired or replaced free of charge at the Metrotech Corporation factory or approved Metrotech repair station. The equipment should be returned to our factory by prepaid transportation after requesting and receiving return authorization from our Service Department.

Metrotech's obligations are limited to repair or replacement of broken or defective parts which have not been abused, misused, altered, or accidentally damaged, or at the option of Metrotech, to refund of the purchase price. Metrotech assumes no liability for removal or installation costs, consequential damages, or contingent expenses of any other nature.


82379